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## ORIGINAL MEMOIRS.

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### THE TREATMENT OF THE UNDESCENDED OR MALDESCENDED TESTIS ASSOCIATED WITH INGUINAL HERNIA.\*

BY WILLIAM B. COLEY, M.D.,

OF NEW YORK.

Surgeon to the General Memorial Hospital; Associate Surgeon to the Hospital  
for Ruptured and Crippled.

AN undescended testis is not such a very rare complication of hernia, as the statistics at the Hospital for Ruptured and Crippled, as well as those of the London Truss Society show. In 59,235 cases of inguinal hernia in males observed at the Hospital for Ruptured and Crippled from 1890-1907, there were 737 cases of undescended testis.

The basis of the present paper is a study of 126 cases upon which I personally operated. In spite of the fact that the subject has received considerable attention in the last few years (and was the main topic of discussion at the meeting of the French Surgical Society, a year ago) there is by no means unanimity of opinion as to the indications for surgical treatment, and there is also a wide difference of opinion as to the best methods of operation. Furthermore, few large statistics exist in which the after-results of operation are

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stated, and it is with special reference to this point that I trust that my own series may prove of interest.

The testis is first placed in the lumbar region, a little to one side of the vertebra, close to the primitive kidney. It descends along the posterior abdominal wall accompanied by or rather following the vaginal process of peritoneum which has preceded it, until it finally reaches the bottom of the scrotum.

In certain cases and due to a variety of causes, its downward progress may be interrupted at almost any point, giving rise to the different types of undescended or maldescended testis. If its progress is stopped before it enters the inguinal canal, it is called abdominal ectopia; if it is stopped within the inguinal canal, it is called inguinal ectopia; if it passes outward to the external canal into the region of the upper scrotum, it is called pubic ectopia.

The varieties thus far mentioned refer only to cases of interruption of the organ in its normal descent. There are cases, however, which, instead of being described as "undescended testis" more properly come under the heading of maldescended testicle, the testicle occupying some abnormal position, *e.g.*, perineum, Scarpa's triangle, or the aponeurosis of the external oblique, in the region of the anterior superior spine. These different varieties may be designated as inguinoperineal, inguinoperineal, and inguinocrural ectopia.

Perineal ectopia, although described by Hunter in 1786 and afterwards by Curling in 1841, has received very little attention by surgical writers. Curling was the first to give a detailed description of the condition in 1857, and a report of 9 collected cases. He was also the first one to treat the condition by operation. The patient was an infant 4 weeks old. The result of the operation was unfortunate.

Godard in 1857 and 1860 reported two interesting cases, one a man 56 years of age, another of 22. The first case was originally an inguinal ectopia which, after having worn a bandage for a considerable time, became perineal; the second case was cruroscrotal ectopia.

In 1858 Partridge reported a case in which he performed castration. Some years later, James Adams reported the 13th case treated by operation up to that time. The patient died of peritonitis following the operation.

Annandale in 1879 was the first one who reported a case successfully treated by surgical intervention.

Monod and Terrillon in 1889 collected 30 cases of perineal ectopia, which number Weinberger in 1899 increased to 65. Adding to this the more recent cases collected by Klein in his admirable "*Thèse de Paris*" on Ectopia, we have a total of 81 cases up to this date.

As to the frequency of perineal ectopia, Rennes and Marshall report only 17 cases of ectopia in 14,400 recruits examined for military service, but not one of these is stated to be perineal.

Godard in 53 cases of ectopia found only 3 examples of the perineal variety.

McAdam Eccles in his work on the imperfectly descended testis states that out of 936 instances of imperfect descent of the testis, associated with hernia, only 5 were found to be of the perineal variety.

My own statistics show 9 examples of perineal ectopia in 126 cases of hernia with undescended or maldescended testis operated upon.

At the Hospital for Ruptured and Crippled there have been observed during the past 18 years 737 cases of undescended testis, and of these only 15 were of the perineal type. In 6 no operation was performed.

As regards the age of the patients, while the disease is of congenital origin, the testis is not always found in the perineum at birth. In certain cases it is situated just outside of the inguinal ring, or has passed below the pubic bone, and later on reaches the perineum. In practically all of my own cases the testis had always been present in the perineum, as far as was known. In the great majority of cases the condition is unilateral.

Hutchinson has reported one case in which both testicles

in a total of 2200 operations for hernia of all varieties were in the perineum, and Ammon has published a second such case.

*Heredity.*—Godard mentions a case in which the condition occurred in father and son, and Klein reports a case in which the brother of a patient had multiple dystrophies, particularly hypospadias.

*Etiology.*—Authorities differ widely as to the precise cause of descent of the testis into the perineum. Until recently there was a tendency to accept fully the opinion of Curling that had become almost classic, that the principal and almost only agent connected with the descent of the testis was the gubernaculum; and as the latter was admitted to have several fasciculi, one attached to the lower part of the scrotum another extending into the perineum to the margin of the ischium and a third into the pubic or femoral region, this seemed an easy and sufficient way of accounting for the different types of maldescent of the testis. In the perineal variety the fibres were supposed to be more fully developed than in the inguinal type, and by traction the testicle became lodged in this region.

Godard accepted the theory fully and believed nothing more simple than this explanation,—no gubernaculum and the testis remains within the abdomen; no middle fasciculus, and inguinal ectopia occurs, while in the event of the anomalous insertion of the fasciculus either in Scarpa's triangle or the ischium, we have cruroscrotal and perineal ectopia.

However, Bramann, in 1884, made a very careful study of 40 human embryos with special reference to the migration of the testicle, and as a result of these investigations declared that he had never been able to determine that the vaginal sac divides the fibres of the gubernaculum as it becomes inserted in the bottom of the scrotum.

Lockwood, in 1887, made one of the most careful anatomical studies of the undescended testis that has ever been made, and proved anew the plurality of the inferior insertions of the gubernaculum, and showed that during the 6th and 7th

month the fibres of the latter penetrate the inferior portion of the abdominal wall and extend into the triangle of Scarpa; others are attached to the pubis and root of the penis; others again extend behind the scrotum; in the 8th month, as dissections have shown, many of the inferior fibres of the gubernaculum pass into the peritoneum ending in the tuberosity of the ischium or become one with the sphincter ani.

Lockwood believes the gubernaculum the main factor in the descent of the testes, and attributes the various types of maldescent to over-development of portions of the gubernaculum lying in these particular regions. He states: "The muscular structure of the gubernaculum is, I think, unquestionable, and it seems irrational to deny its tissues their function, namely, that of traction." He regards it of special significance that in case of maldescent, the testicle migrates into particular regions in which, as has been well established, the fibres of the gubernaculum exist. I do not believe that Lockwood's argument is entirely convincing.

Later, Sébileau, after careful personal research upon the coverings of the testicle and its migration, concludes that "perineal ectopia is a purely congenital affair. It depends neither upon pathological nor anatomical causes and least of all upon the gubernaculum." He recognizes that the absence or insufficient development of the gubernaculum may explain abdominal and iliac retention. As regards the inguinal and extra-inguinal, he believes that the abdominal wall itself plays a very real and important rôle in offering difficulty to the complete passage of the testicle through the external ring.

Championniere in his "clinical lecture on anomalies of the testicle," gives the result of 44 operations in 39 patients. He strongly opposes the theory of the gubernacular origin of the undescended testis and says that only a physiology as legendary as that which, in former times, accepted multiple testes as proven facts, can seek to explain the descent of the testis by a legendary origin of the gubernaculum testis. The defects of the gubernaculum are invoked as a cause of non-descent and, quite naturally, these writers seek to supply its deficient

action by traction made upon the testicle either in the direction of the scrotum or in the direction of the thigh by structures more or less doubtful. Without discussing this, as he terms it, childish theory of the gubernaculum testis, Championniere states that we must admit that we do not know the cause of this descent. We can, however, generally affirm that we do know certain conditions which hinder it.

Championniere concludes from his observations that an ectopic testicle should always be preserved for the reason that, although it may have no functional value, it has an important influence upon the general health and virility of the subject. His own series of cases however shows that in 15 cases the testicle was sacrificed and in 19 cases orchidopexy was performed.

Among the chief reasons which have influenced Championniere as well as others to sacrifice the testicle, has been the idea that by so doing a radical cure of the accompanying hernia would be more certainly effected. However, Championniere's own statistics as well as those of other men, have shown that the herniæ remained cured in practically all cases without regard to whether or not the testicle has been removed. Hence, such reason for orchidectomy no longer obtains.

Championniere believes that a hernia practically always accompanies ectopia of the testicle of whatever variety and adds that although he performed two operations for ectopia without finding a hernia, one of these was an old operation and his not finding the hernial sac may have been due to inexperience. My own experience is entirely in harmony with this view. In not a single case of my entire series, 126 in number, did I fail to find a hernial sac.

Büdinger, one of the most recent writers upon the etiology of the undescended testis, states that he has operated upon 24 cases of inguinal retention of the testicle and that mechanical obstruction of some sort was found to be the cause of the nondescent of the testicle in 15 of these cases. A certain number of anatomical investigations upon cadavers confirmed the result.

**FIG. 1.**

Rare type of undescended testis, with hernial sac and cord extending to bottom of scrotum. Testis arrested at external ring.

One of the latter, a man 40 years of age, was brought to the hospital with cryptogenic pyæmia of which he died. Autopsy revealed the following conditions: The connective tissue of the scrotum proved absolutely normal; the hernial sac and tunica vaginalis propria were found loosely embedded; nowhere was there a structure that could in any way be brought in connection with a gubernaculum. The tunica vaginalis propria was greatly thickened, the sac elongated upward into the shape of a diverticulum. A band extended from the upper portion of the tunica vaginalis along the outer side of the testicle and epididymis, in its lower portion becoming one, partly with the tunica vaginalis, partly with the epididymis.

Büdinger states that while cicatricial adhesions between testicle and epididymis and intestines are given as one of the causes of retention by all authors, his experience has shown him that, though often seen, these phenomena are much less frequent than those peritoneal changes which, while having no direct connection with the gland, nevertheless interfere in an unequivocal manner with the motility of the testicle. He believes the adhesions of the testicle itself to represent an accidental localization of an extensive inflammatory process, rather than a cause in itself of the retention of the organ, and that cicatricial retraction of the peritoneum after inflammatory processes that take place prenatally or in earliest infancy, in the neighborhood of the inguinal canal, using up large areas of peritoneal covering, are a far more frequent cause of retention of the testicle. An undescended testis may prove an abnormally long cord, as shown by Fig. 1.

One of the most valuable of recent contributions to our knowledge of the undescended testis is the paper by Odiorne and Simmons (*ANNALS OF SURGERY*, Dec., 1904.) This paper is based upon a careful study of 77 cases observed at the Massachusetts General Hospital from 1877 to 1904. Inasmuch as orchidectomy was frequently employed, the microscopical study of the testicles removed has added considerable to our knowledge of the pathology of the undescended testis. It was shown that the tunica albuginea was more or less thickened in all the specimens examined, two being "five times thicker than the normal organ," and the interlobular connective tissue, while varying in amount, was generally increased. One of the most striking features of the unde-



scended testis was the "interstitial cells," which were found in all cases and generally in large numbers. These cells, while present in children in whom the testicles have normally descended, are not found in the adult organ. Their function is largely a matter of conjecture. According to Monod and Arthaud they are more often seen in the neighborhood of blood vessels. The specimens described by Odiorne and Simmons exhibited no definite relation to any structure of the testis; they were endothelial in type and of large size, with rounded nuclei.

The undescended testis shows another variation from the normal in the thickening of the basement membrane of the tubules. The epithelial lining of the tubules also shows very marked changes, the epithelial cells being few in number and more or less degenerated and irregular in shape. The so-called Reinke<sup>1</sup> crystals are usually seen in the interstitial fibrous tissues of the undescended testis. The nature and function of these crystals has as yet not been fully determined.

As regards treatment, no uniform method was employed, as the 77 cases were under the care of 15 different surgeons during the period of 27 years. In 28 cases orchidectomy was practised. Of these 17 were performed since 1900, 5 of which were in children, *i.e.*, in cases under 16 years of age. In four cases the testis was reduced into the abdominal cavity. In only 18 cases, 11 adults and 7 children, between 5 and 13 years of age, was orchidopexy performed, or an attempt made to bring the testis into the scrotum.

A perfect result was obtained in only 2 instances of the 7 children; this was in a patient with double retention; in 2 others the result was satisfactory, the testicle having remained in the upper portion of the scrotum. Of the 11 operations done upon adults between 16 and 42 years, 5 remained in the scrotum, one in perfect position, three retracted soon after operation into the canal, where they remained much atrophied; one is the cause of considerable pain. Two retracted into the

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<sup>1</sup> Arch. f. mikr. Anatomie, 1896, p. 34.

pubic region, where they were the source of considerable annoyance, owing to their position.

This analysis suffices to prove that at present there is no definitely settled procedure of dealing with the undescended testis. There is agreement neither as to the proper age of interference nor as to the method of operation.

For many years—a century or more—it has been an almost universally accepted opinion that the undescended testis is peculiarly liable to undergo sarcomatous degeneration (Hunter, Godard, Curling).

McAdam Eccles (1903 Jacksonian Prize Essay) was the first to seriously question this opinion. He stated that close examination of upwards of 48,000 males with hernia, at the London Truss Society showed 854 cases of imperfectly descended testis, or about 2 per cent. In this series there was not a single example of sarcoma of the undescended testis. Furthermore, in 40 cases of sarcoma of the testis observed in one of the large London hospitals during a period of 20 years, there was only one case of sarcoma of the undescended testis. From these and other facts, he concluded that the generally accepted opinion could not be substantiated.

Since the publication of McAdam Eccles' paper, Odiorne and Simmons (*ANNALS OF SURGERY*, Dec., 1904) incline to accept the older opinion, in favor of which they cite 54 cases of malignant disease of the testis observed at the Massachusetts General Hospital during a period of 26 years. Of these 6, or 11 per cent. occurred in the undescended testis. They further state that Schödel, quoted by Von Kahliden, has reported 41 cases of sarcoma of the testis observed in a large London hospital in one year, of which 5, or 12 per cent. occurred in the undescended testis. This latter statement is clearly incorrect, since sarcoma of the testis is too rare a condition to be observed 41 times in a single hospital in one year.

McAdam Eccles states that among 4,200 male patients admitted annually to a large London hospital, there has been only an average of 2 cases of sarcoma of the testis during a period of 20 years.

Our observations at the Hospital for Ruptured and Crippled are quite in harmony with the facts related by McAdam Eccles. Since 1890 59,235 cases of hernia in males have been observed, in only 737 of which an undescended or maldescended testis was found, and not a single case of sarcoma of the undescended testis.

Personally, I have observed 34 cases of sarcoma of the testicle. The first 25 all occurred in normally descended testes, in the 26th and 27th and 34th cases the sarcoma developed in an undescended testis; all were examples of abdominal ectopia. This would make 8.8 per cent. of sarcomas of the testis originating in the undescended organ.

While the facts submitted by Eccles as well as the statistics at the Hospital for Ruptured and Crippled do not fully justify his conclusion (for the reason that a patient with a sarcoma of the undescended testis would not necessarily go to a hernia clinic, but to a general hospital) it is probably true that the danger of the undescended testis from the development of sarcoma is much less than has generally been supposed. It should be noted that the danger is much greater in abdominal than in the other varieties of ectopia.

Many surgeons have advised operation in the very young children, *e.g.*, 2 years of age or even younger. Such practice ignores the fact that in a large proportion of cases of undescended testis in young children, the organ will reach the scrotum by the age of puberty without surgical interference. In just what proportion of patients the undescended testis finally reaches the scrotum, has never been determined, I am at present engaged in tracing a large series of non-operated cases observed from 5 to 15 years ago.

That this is true is shown by the study of the statistics of any large hernia clinic. Of 739 cases of undescended testis observed at the Hospital for Ruptured and Crippled, since 1890, 561 occurred in 18,410 children under the age of 14 years, or 3 per cent; while only 92 cases occurred in 3,848 between the ages of 14 and 21 years, or 2.2 per cent.; and only 75 cases in 37,370 over 21 years of age, or .2 per cent.

That is, under the age of 14 years undescended testis is 15 times more frequent than after the age of 21 years.

Inasmuch as only comparatively few cases have been cured by operation during this period, the only conclusion is that the majority of undescended testes seen in infancy and early childhood eventually reach the scrotum through natural causes before the age of 14 years. Still another reason for deferring operation is the fact that the results of operations performed between the ages of 12 and 14 years are far better than those of an earlier age. One reason advanced in favor of early operation is that hernia associated with undescended testis is far more liable to strangulation. This assumption I believe to be incorrect, and not supported by facts. We have never observed a case of strangulation of a hernia with undescended testis at the Hospital for Ruptured and Crippled.

The results of the treatment of the undescended testis in France, as brought out at the Congress of Surgery in 1906, were as follows:

Villard reported 116 operations, with 56 perfect results, 42 doubtful ones and 18 failures. He stated that as a result of operation there is usually decrease of pain and increase of the virility of the individual, but the influence upon spermatogenesis is practically nil.

Kernisson, of Paris, reported 80 operations for undescended testis from 1898 to 1905, without any serious complications. Thirty-nine were examined as regards late results. Of these the testis was found in the scrotum in 15 cases; in ten at the root of the scrotum; in 9 at the orifice of the inguinal canal. In 2 or 3 cases only was the testicle well developed. In 10 cases associated with hernia, Bassini's operation was performed.

De Page reported 20 cases, of which 5 were double. Ten were traced, and in 7 of these the testicle was found in its normal position; in three others the testicle had retracted toward the external ring.

As regards the indication for operation, Villard would

not operate upon the abdominal variety of ectopic testis, for the reason that the operation is dangerous and the result uncertain. In simple cases, not complicated with hernia, he advised non-interference under the age of 10 years, and then closing the canal by Bassini's method.

While some of the surgeons advised operation in childhood as early as the second or third year, *e.g.*, Girard, the weight of opinion was in favor of postponing the operation until at least the fifth or sixth year and some until the age of ten, *e.g.*, Villard and Kermisson.

Broca's results still remain the most complete and most comprehensive (Bulletin Soc. de Chir. 28, 1902, p. 761). He reported 138 operations for inguinal ectopia associated with hernia, all cases occurring in children. Sixty-two patients with 79 operations were examined at periods of one year and upward after operation. Thirty-one showed perfect results; 35 fairly good results. Thirteen cases may be classed as failures as regards the testis remaining in position, although there was no return of the hernia. In all of these cases the testis showed more or less atrophy and in most of the cases the atrophied testis had retracted to the neighborhood of the external ring, or in some cases into the canal itself.

#### METHODS OF OPERATION.

The various methods of operation may be classified as follows: (1) Freeing the testicle and cord, with suture of the testis to the scrotum itself (Wood, Nicoladoni, Horsley); (2) freeing the testicle and anchoring it to the testis on the opposite side (Tuffier, Championniere, Sébilleau); (3) cutting away all the structures of the cord except the vas and its vessel, then anchoring the testicle in the scrotum by placing the testis in the scrotum with or without suture (Mignon and Bevan). Suturing the cord to the tissues forming the external ring (Rieffel).

A number of other methods have been proposed, though not extensively followed, *e.g.*, pushing the testicle through an opening in the scrotum and burying it in the tissues of the

thigh temporarily, later returning it to the scrotal cavity (Keetley). Most surgeons, with the exception of Broca, close the inguinal canal by Bassini's method. Bevan was one of the first to recognize the disadvantages of this method of closure, inasmuch as a gain in length of the cord of  $\frac{1}{2}$ -1 in. or more may be obtained by not transplanting the cord, bringing it out at the lower angle of the wound (modified Bassini).

The method of operation which I have employed has been: Bassini's incision, freely opening the aponeurosis of the external oblique as high up as possible, surrounding the cord and hernial sac, which latter has always been found present. Grasp the lower portion of the tunica vaginalis and by traction bring the testicle as far down as possible. Next, separate the sac from the cord, high up, just outside the internal ring. (In children this requires very careful and delicate dissection, as the cord is usually greatly enlarged and spreads out in a fan-like manner over an area of the sac 1-2 in. in size.) If the dissection has been begun at the right layer, the sac can be isolated and is then tied off as high as possible. In most cases of inguinal retention the cord can then be freed sufficiently to permit the testicle to be brought at least into the upper portion of the scrotum, in most cases into the lower part, with the sacrifice of but few, if any, of the veins. Except in a very few of the early cases, I have never made any attempt to anchor the testis in the scrotum, but rely upon careful freeing of the cord high up. Suturing of the testicle within the scrotum is, in my opinion, of little value. If there is any tension, the scrotum is retracted up toward the external ring. The canal is then closed by the modified Bassini method, *i.e.*, the cord is brought out at the lower end of the wound; the internal oblique is then sutured to Poupart's ligament over the cord. Great care is taken in placing the lowermost suture, which should include the reflected portion of the external oblique as well as the conjoined tendon and Poupart's ligament on the outer side. This suture, when tied, makes but a very small external ring, too small ever to permit the testis to retract into the canal, even should it reach the ring.

Bevan in 1899 and later in 1903 (*Jour. Am. Med. Ass'n.*) described a new method of operation for the undescended testis and strongly urged the more general employment of surgical treatment for this condition. His method consists in brief in a free opening of the canal by Bassini's incision of the skin and aponeurosis; cutting off the hernial sac high up beyond the internal ring; cutting away all the fascia and muscular fibres that hold the cord and testicle fixed in the canal; passing the finger into the iliac fossa and stripping the vas deferens from the peritoneum by means of blunt dissection, even sacrificing the veins and spermatic artery, if necessary to secure sufficient motility of the testis, to permit of its being brought into the scrotum without suture. The canal is then closed by the modified Bassini method, without transplantation of the cord. The external ring is carefully sutured to prevent the testicle from again entering the canal, should retraction take place.

Up to 1903 Bevan had operated upon 20 cases, although the late results of these cases are not given. He advises operation in all cases in which the testis can be palpated and believes the most favorable age of operation to be between the sixth and twelfth year.

#### CASES OF MALDESCENDED HERNIA OF SPECIAL INTEREST.

##### (A) *Inguinoperineal Hernia.*

CASE I.—J. M., aged 27 years; congenital, right side. Operation in 1895, at the Post-Graduate Hospital. A tumor the size of a child's head occupied a large pouch made of the dilated skin of the peritoneum and extended to the margin of the anus. (Fig. 2.) The right scrotum was empty and atrophied; testicle at the bottom of the hernial sac. A regular Bassini incision was made and the pouch found to contain small intestine omentum and the testis. On reduction of the contents, the testis was found at the bottom of the sac in the peritoneum and greatly atrophied. The testis and cord were removed and the wound closed by Bassini's method. No relapse of the hernia one year later, at which time the patient was drowned.







CASE II.—W. G., aged 17 years; congenital, right inguinal hernia with perineal ectopia. Operation in 1901 at the General Memorial Hospital. The hernial sac was found to communicate with the abdominal cavity and, at the bottom of this, in the perineum about one inch from the margin of the anus, was the testis, almost normal in size. The regular Bassini incision was made in this case as in the preceding and the upper portion of the sac was removed and tied off flush with the abdominal cavity; a sufficient amount of the lower portion was left to furnish a new and complete covering to the testicle; it was united with purse-string suture. The testis was then transplanted into a pouch in the scrotum made by digital dilatation. Examination six years later showed the testis occupying a normal position in the scrotum and normal in size.

CASE III.—A. S., aged 35 years. The patient had noticed the hernia for only six years and had worn a truss the entire time. Operation July, 1896. The right scrotum was found to be empty and the testis which was atrophied to half normal size, was found in the anterior portion of the perineum. In this case the testis was not transplanted into the scrotum; wound closed by Bassini's method. Examination 5 years later showed the testis still occupying the anterior perineal region, no further atrophied.

CASE IV.—Infant, aged 7 months; left inguinoperineal hernia, sliding hernia of the sigmoid. Operation was undertaken at this early age for the reason that it was impossible to control the hernia by any form of truss. The operation was done at the Hospital for Ruptured and Crippled in Jan., 1908. The testis was found in the mid-perineum and normal in size; it was transplanted into the scrotum. The hernia was reduced and the wound closed by Bassini's method.

CASE V.—W. C., 16 years of age, had noticed a swelling in the right groin since a few days only. Physical examination shows the testis in the right mid-perineal region, a hernia in the canal, which, however, does not enter the perineal region. Operation Aug. 27, 1896, at the Post-Graduate Hospital. Bassini's incision for inguinal hernia. A small hernia sac is found extending down nearly to, but not communicating with the tunica vaginalis, which contained some bloody fluid in its cavity. The testis was found occupying the mid-perineal region and could be

pushed back almost to the anal margin. The right scrotum was empty and flat; the testicle and tunica vaginalis were dissected out from the perineum and transplanted into the scrotum in normal position. The inguinal canal was closed by Bassini's method. Examination 4 months later showed the testis of normal size, in the bottom of the scrotum.

CASE VI.—A. D., aged 29 years, admitted to the General Memorial Hospital in April, 1907, with a history of having had a swelling in the right mid-perineal region since childhood, which had given him considerable trouble of late in sitting and walking; the right scrotum had always been empty. Examination showed the right testicle occupying the mid-perineal region with the physical signs of an inguinal hernia passing down to the region of the testis. (Fig. 3.) Operation was performed in April, 1907. The testis was found to be normal in size; the hernial sac which communicated with the tunica vaginalis, was removed high up. Sufficient peritoneum was left to make a complete covering for the testis. The testis and cord were then transplanted into a pouch made by manual dilatation in the right scrotum. The wound was closed by the modified Bassini method, not transplanting the cord. The patient came to see me again in October. Examination at this time showed the testis had again retracted into the perineal region. I did a second operation, without opening the inguinal canal, brought the testis to the bottom of the scrotum and there sutured it with catgut. The testis has remained in perfect position since, the last examination having been made on March 28, 1908, six months later.

CASE VII.—T. E., aged 40 years. Right inguinoperineal hernia since infancy. Operation General Memorial Hospital, 1902. Testis transplanted into scrotum. Hernia wound closed by modified Bassini operation. Examination 5 years later showed testis in normal position. Testis slightly atrophied at time of operation, no further atrophy.

CASE VIII.—M. H., aged 5 years. Left inguinoperineal hernia. Operation Hospital for Ruptured and Crippled, November 15, 1895. Testis found in anterior portion of perineum, with hernial sac communicating with tunica vaginalis. Testis transplanted into scrotum. Wound closed by Bassini's method. Examination 8 years later showed testis in normal position; no atrophy.



CASE IX.—F. E., aged 40 years, had noticed swelling in the right perineal region since childhood. Operation at the General Memorial Hospital Oct. 1, 1902. Bassini's incision for inguinal hernia. The right testis was found in the mid-perineal region, the tunica vaginalis communicating with a large hernial sac which contained a mass of irreducible omentum. This was tied off in small sections and the stump reduced into the abdominal cavity. The testicle was transplanted into the right scrotum. Examination May 6, 1907, showed the result perfect.

In addition to the preceding cases, I have observed at the Hospital for Ruptured and Crippled since 1890, six other cases of perineal ectopia which were not operated upon. Whether or not the ectopia was associated with a hernia could not be determined without operation. One, aged 5 years, left side; another aged 21 months, right; a third aged 7 months, right side. The other three cases were in adults.

(B) *Inguinosuperficial Hernia With Undescended Testis.*

CASE X.—*Inguinosuperficial hernia with bilocular sac.*—That a diverticulum of peritoneum or hernial sac may occupy an unusual position irrespective of the action of the gubernaculum, is illustrated by the following case:

L. N., aged 30 years, was operated upon at the Post-Graduate Hospital, Feb. 25, 1897, for strangulated omental hernia of large size. The patient gave a history of having had no hernia nor even impulse on coughing prior to 24 hours before admission. While engaged in dancing a tumor appeared in the left iliac and scrotal region, about the size of a fist. It was very painful and could not be reduced. Nausea and occasional attacks of vomiting followed; but there was a small movement of the bowels. Physical examination showed a tumor occupying the upper scrotal region, extending up over the aponeurosis of the external oblique as far as the anterior superior spine. The whole tumor was completely dull on percussion. The diagnosis of strangulated omental hernia was made and immediate operation advised. On cutting through the skin a tumor was found emerging from the external ring, which was very tightly constricted and composed of two loculi, one passing down into the upper scrotum, the other upward, resting upon the aponeurosis of the external oblique. The

canal was first opened and then the sac, which was found to contain a large mass of deeply congested omentum, with several ounces of bloody serum; no intestine was present. (Fig. 4.) The testis was found to occupy the lower portion of the bilocular sac, the upper one containing only the imprisoned omentum. The patient made an uninterrupted recovery.

In this case we undoubtedly had to deal with a bilocular sac of congenital origin which had been entirely empty up to 24 hours prior to operation, when a mass of omentum was forced into the sac. The old explanation of such sacs being due to the gradual dilatation of a hernia prevented from passing downward by the testis, and following the line of least resistance upward, does not hold good in this case.

The recent investigations made by Murray, of Liverpool, who has examined 200 cadavers of adults who had had no history of hernia during life, showed that congenital diverticuli are by no means infrequently found in the femoral canal, he having found 47 such instances in the above series of examinations.

These facts, I think, enable us to explain perineal ectopia as well as the inguinoperitoneal variety, as the result of an unusual prolongation of a peritoneal diverticulum, rather than the result of traction of a more or less imaginary fasciculus of the gubernaculum.

CASE XI.—*Inguinosuperficial hernia with trilocular sac.*—A. H., 24 years of age; right undescended testis with right inguinoperitoneal hernia. The patient gives a history of the testis never having been felt on the right side; a swelling having been noticed for a number of years, often disappearing on lying down. Operation March 1, 1908, at the General Memorial Hospital. On making the usual incision for Bassini's operation for inguinal hernia, cutting through the skin and superficial fascia, an empty sac was found resting upon the aponeurosis of the external oblique, and extending nearly to the anterior superior spine. The right scrotum was empty and the external ring small. On splitting up the aponeurosis of the external oblique, a second interstitial sac was felt situated between the external and internal oblique, about  $2\frac{1}{2}$  in. in diameter. At











the bottom of this sac, resting on the transversalis muscle and attached to the pubic bone, the testis was found. It was somewhat atrophied, being about two-thirds normal size. The internal ring was rather small and did not permit of the return of the testis into the abdominal cavity. There was still a third loculus of the sac communicating with the external and internal loculi and occupying the upper part of the scrotum. (Fig. 6.) This was empty. A portion of omentum, about 3 in. long, about the size of the little finger occupied the inner sac and at its distal end was adherent to the testis. This was removed. The peritoneum was tied off well above the internal ring and sufficient left to make a perfect covering for the testis. The cord was thoroughly freed and the testis brought into the lower part of the scrotum without much tension. The wound was closed by the modified Bassini method, without transplanting the cord.

The inguinoperitoneal variety of hernia (Figs. 7 and 8) has been regarded as an extremely rare type. Moschcowitz (Med. Rec. Vol. LXIII, p. 62, 1903) in reporting a case, stated that only 17 were recorded in the literature.

This type of hernia has already been described by Macready and Küster, and up to recently, very few cases have been reported. That the condition is much more common than has been recognized, is shown by the statistics at the Hospital for Ruptured and Crippled, as well as by my own cases operated upon elsewhere. Personally I have operated upon 25 cases, 10 adults and 15 children. The adults were between 16 and 33 years of age; the children between 5 and 13 years. In all but two cases the testis was either found in the superficial sac resting on the aponeurosis of the external oblique, or it could be made to enter this sac on coughing. In 2 cases, already referred to, the testis had evidently never occupied the external sac (vide Case X).

This type of ectopia I believe to be due to the fact that the vaginal process of the peritoneum has, for some unknown reason been turned upward upon the external oblique instead of taking its normal course into the scrotum.

The treatment of this variety of maldescended testis is extremely satisfactory, for the reason that in most cases the cord is sufficiently long to enable the operator to bring the testis into the scrotum with little or no tension.

CASE XII.—*Unusual type of abdominal ectopia* (see Fig. 9). The patient, aged 17 years, with double undescended testis, was operated on April 18, 1908, at the General Memorial Hospital. On palpation it was thought that an atrophied testis could be felt on the right side, but operation showed an empty vaginal process extending into the scrotum. The bottom of this process was thickened into folds which gave the feeling of an atrophied testis. On the outside of the vaginal process or sac, posteriorly, exactly corresponding to the cord and its vessels in the normal condition, there were a number of vessels, arteries and veins which made up a false cord. These vessels became lost at the bottom of the sac. The testis itself, fully developed, was found in the abdominal cavity, was brought out and by carefully freeing the peritoneal and muscular bands was brought into the bottom of the scrotum.

#### ANALYSIS OF CASES.

This series of cases comprises 128 operations. Of these 25 represented an ectopia of the inguinoperineal type, with the testis and sac resting upon the aponeurosis of the external oblique. There were 9 cases of the inguinoperineal type, the sac and testis occupied the perineal region.

There has been no recurrence of the hernia in a single only two cases was the testis sacrificed. In both the patients were adults and in one a small atrophied testis was found in the bottom of the sac of a very large inguinoperineal hernia. The other case was one of abdominal ectopia, in which the testis could not be brought outside of the external ring.

There has been but one recurrence of the hernia. Seventy-two cases have been traced from 1 to 15 years with the following results: 52 children were traced from 1 to 15 years, 17 less than one year, 15 not traced; of 44 adults, 19 were traced 1 to 10 years, 4 traced less than 1 year, 21 not traced.

*Results in Adults.*—Of 19 adults examined from 1 to 10 years after operation the testis was found in good position in

1000

the scrotum in 8 cases and at the external ring or not stated in the others.

One case deserves special mention, inasmuch as it shows the probable influence of the operation upon epilepsy:

The patient, aged 25 years, was operated upon 5 years ago, for right undescended testis of the inguinal type. The testis was brought into the scrotum and has remained in good position ever since. At the time of the operation he stated that he had been subject since childhood to epileptiform seizures, the attacks occurring frequently, often within 1 to 2 weeks. In a letter received January, 1908, he states that he has never had a single attack since the time of the operation. The patient was presented before the New York Surgical Society at the time the paper was read.

*Results in Children.*—Testis in scrotum in 11 patients; testis outside of external ring in 15 patients and in canal or not felt in 4. The following cases illustrate the results in some of the patients traced for a considerable period of time:

CASE 1, aged 13 years at the time of operation. Examination 13 years later, shows the testis atrophied and resting just outside of the external ring.

CASE 2, aged 13 years at the time of operation. Letter 13 years later, states the testis is normal and in the scrotum. Patient is married and has one child.

CASE 3, aged 8 years at the time of operation. Examination 4 years later shows testis atrophied, just outside the external ring.

CASE 4, aged 5 years; inguinoperineal type operation. Testis in scrotum 8 years after operation.

CASE 5, aged 6 years at the time of operation. Testis just outside the external ring, 7 years later; no atrophy.

CASE 6, aged 5 years at the time of operation. Testis just outside the external ring, 5 years later.

CASE 7, aged 9 years at the time of operation. Testis in scrotum, full size, 9 years later.

CASE 8, aged 12 years at the time of operation. Testis fully descended; examination 7 years later.

CASE 9, aged 10 years at the time of operation. Testis in normal position; no atrophy; examination 5 years later.

CASE 10, aged 13 years at the time of operation. Double, undescended testis, superficial inguinal kind. Operation, 1905. Examination 2 years later shows both testes of normal size, in the upper part of the scrotum.

TABLE OF CASES OF UNDESCENDED AND MALDESCENDED TESTIS ASSOCIATED WITH INGUINAL HERNIA. TREATED BY OPERATION. 1893 TO 1908.—(A) SECTION OF CHILDREN.

No.	Name	Age	Side	Position of testis	Date	Disposition of testis	Method of operation for hernia	Immediate result	Subsequent history
1	V. S. ....	13	Right	Inguinal	Feb., '93	Testis brought into scrotum. Anchored by cat-gut suture	Bassini	Primary union	Examination 13 years later shows atrophied testis just outside external ring. Hernia cured. Examination 4½ years later shows testis atrophied outside external ring. Traced only 4 months.
2	G. R. ....	8	Left	Inguinal	1, 18, '93	Testis brought into scrotum. Anchored by cat-gut suture	Bassini	Primary union	
3	J. O. C. ....	9	Left	Inguinal	6, 12, '94	Testis brought into scrotum. Anchored by cat-gut suture	Bassini	Primary union	
4	M. C. ....	12	Right	Inguinal	1, 11, '95	Testis brought into scrotum. Anchored by cat-gut suture	Bassini	Primary union	Examination 13 years later shows testis normal. Patient married; has one child. Traced 8 years after operation. Normal.
5	M. H. ....	5	Left	Inguino-perineal	11, 15, '95	Testis transplanted to length scrotum. Cord normal	Bassini	Primary union	
6	G. G. ....	6	Right	Inguinal	3, 27, '96	Testis brought outside external ring. Cord not made to reach scrotum	Bassini	Primary union	Examination 7 years later. Testis atrophied. External ring; not atrophied.
7	T. W. ....	10	Left	Inguinal	3, 27, '96	Testis brought into upper scrotum	Bassini	Primary union	Well. 1 year later.
8	D. M. ....	9	Right	Inguinal	7, 31, '96	Testis atrophied. Placed in upper scrotum	Cord not transplanted (modified Bassini)	Primary union	Testis just outside external ring 5 years later.
9	R. B. ....	9	Left	Inguinal	5, 21, '97	Testis brought into sac	Bassini	Primary union	Testis could not be felt 6 months later.
10	H. C. ....	14	Left	Inguinal	7, 30, '97	Testis brought outside external ring	Bassini	Primary union	Well 7 years later.
11	M. G. ....	7	Left	Inguinal	10, 29, '97	Testis brought into upper scrotum	Bassini	Primary union	Traced 1 year.
12	J. M. ....	9	Left	Inguinal	6, 17, '98	Testis brought into scrotum	Bassini	Primary union	Traced 4 years.
13	W. T. ....	9	Left	Inguino-superficial	9, 2, '98	Testis brought into scrotum	Bassini	Primary union	Traced 1 year.
14	O. S. ....	11	Left	Inguinal	10, 7, '98	Testis brought beyond external ring	Bassini	Primary union	Traced 2 years.

## MALDESCENDED TESTIS.

343

15	J. M.	5	Right	Inguinal	10, 14, '98	Testis brought beyond external ring	Bassini	Primary union	Traced 7 years. Testis atrophied just outside external ring.
16	H. M.	9	Right	Inguinal	11, 4, '98	Testis brought beyond external ring	Bassini	Primary union	Traced 8 years. Testis in bottom of scrotum same size as other.
17	S. P.	7	Right	Inguinal	7, 21, '99	Testis brought beyond external ring	Bassini	Primary union	Traced 8 years. Testis atrophied outside external ring.
18	W. A.	11	Left	Inguinal	8, 4, '99	Testis brought beyond external ring	Bassini	Primary union	Traced 4 years. Testis up per scrotum normal size.
19	W. W.	11	Right	Inguinal	3, 30, '00	Testis brought beyond external ring	Bassini	Primary union	Traced 6 years. Testis just outside external ring.
20	A. S.	4	Right	Inguinal	5, 18, '00	Testis brought beyond external ring	Bassini	Primary union	Traced 5 years.
21	I. G.	12	Right	Inguinal	7, 13, '00	Testis brought beyond external ring	Bassini	Primary union	Traced 7 years; fully descended normal testis.
22	J. H.	10	Right	Inguinal	8, 3, '00	Testis brought into upper scrotum	Bassini	Primary union	Traced 2 years.
23	L. H.	9	Right	Inguinal	8, 10, '00	Testis brought into upper scrotum	Bassini	Primary union	Traced 8 years. Testis outside external ring size of hickory nut.
24	B. C.	7	Left	Inguinal	9, 14, '00	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
25	H. W.	11	Left	Inguinal	6, 7, '01	Testis brought into upper scrotum	Bassini	Primary union	Traced 7½ years. Testis external ring.
26	J. S.	10	Right	Inguinal	1, 3, '02	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
27	A. W.	12	Left	Inguinal	1898	Testis brought into upper scrotum	Bassini	Primary union	Traced 10 years. Testis in canal.
28	J. L.	8	Left	Inguino-superficial	2, 14, '02	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
29-30	O. H.	10	Double	Inguino-superficial	3, 20, '02	Both testes brought into lower scrotum. Cord normal length	Bassini	Primary union	Traced 5 years. Testis in good position.
31	M. V. H.	.....	Right	Inguinal	6, 27, '02	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
32	J. B.	8	Right	Inguino-superficial	9, 5, '02	Testis brought into upper scrotum	Bassini	Primary union	Traced 5½ years. Well.
33	R. K.	10	Left	Inguinal	9, 5, '02	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
34	A. H.	5	Right	Inguinal	1, 9, '03	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
35	L. K.	5	Left	Inguinal	1, 23, '03	Testis brought into upper scrotum	Bassini	Primary union	Traced 8 months.
36	J. F.	9	Right	Inguinal	4, 10, '03	Testis brought into upper scrotum	Bassini	Primary union	Not traced.



TABLE OF CASES OF UNDESCENDED AND MALDESCENDED TESTIS ASSOCIATED WITH INGUINAL HERNIA. TREATED BY OPERATION. 1893 TO 1908.—SECTION OF CHILDREN.—Continued.

No.	Name	Age	Side	Position of testis	Date	Disposition of testis	Method of operation for hernia	Immediate result	Subsequent history
37	J. S.	7	Left	Inguinal (interstitial sac)	4, 20, '03	Testis brought into upper scrotum	Bassini	Primary union	Traced 4 years. Testis not felt.
38	M. L.	8	Left	Inguinal	5, 1, '03	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
39	J. C.	11	D'ble	Inguinal	5, 1, '03	Testis brought into upper scrotum	Bassini	Primary union	Traced 4 months.
40	R. S.	9	Right	Inguinal	5, 29, '03	Testis brought into upper scrotum	Bassini	Primary union	Traced 4 years.
41	W. T.	12	D'ble	Inguinal	10, 30, '03	Testis brought into upper scrotum	Cord not transplanted on either side	Primary union	Traced 4 years.
42	H. W.	11	Left	.....	10, 30, '03	Testis brought into lower scrotum without tension	Cord not transplanted	Primary union	Traced 4 years.
43	O. H.	12	Right	Inguino-superficial (Transatlantic) kick in groin	1, 22, '04	Testis placed in bottom of scrotum	Bassini	Primary union	Traced 9 months.
44	J. B.	7	Left	Inguino-superficial	2, 5, '04	Testis placed in bottom of scrotum	Bassini	Primary union	Traced 4 years. Testis not felt.
45	T. M.	7	D'ble	Inguinal	2, 19, '04	Testes placed in scrotum	Bassini. Left cord not transplanted	Primary union	Hernia cured; both testes just outside external ring April, 8, 1908; 4 years testes about one-half normal size.
46	H. M.	14	Left	Inguinal	4, 15, '04	Testis brought into upper scrotum	Bassini	Primary union	Not traced.
47	L. B.	10	Right	Inguinal	3, 25, '04	Testis brought into upper scrotum	Bassini	Primary union	Traced 2 years.
48	C. S.	6	Left	Inguinal	4, 22, '04	Testis brought into lower scrotum	Bassini	Primary union	Not traced.
49	M. M.	8	Right	Inguinal (Putré) Testes join outside internal ring	9, 16, '04	Testis brought into upper scrotum	Cord not transplanted	Primary union	Traced 1 year.
50	S. I.	13	Right	Inguinal	11, 4, '04	Testis brought into upper scrotum	Bassini	Primary union	Testis at external ring few months after operation.
51	A. S.	12	Left	Inguinal	1, 13, '05	Testis placed in scrotum	Bassini	Primary union	Traced 3 years; good position
52	H. A.	8	Right	Inguino-superficial	2, 17, '05	Testis placed in scrotum	Cord not transplanted	Primary union	Not traced.
53	H. S.	12	D'ble	.....	5, 15, '04	Testes brought into scrotum	Cord not transplanted either side	Primary union	Traced 1 year; both testes still in upper scrotum, not atrophied.

58	P. A. ....	4	Right	Inguinal	3. 17. '05	Testis brought into scrotum	Cord not transplanted	Primary union	Traced 2 years.
59	J. F. ....	6	Right	Inguinal. Testis at internal ring	4. 14. '05	Testis brought into scrotum	Cord not transplanted	Primary union	Traced 2 years.
60	G. L. ....	8	Left	Inguinal	9. 22. '05	Testis brought into scrotum	Bassini	Primary union	Not traced.
61-62	E. S. C. ....	13	D'ble	Inguino-superficial	11. 23. '05	Both testes placed in bottom of scrotum	Bassini, both sides	Primary union	Traced 2 years; both testicles outside external ring, no atrophy.
63	H. B. ....	12	Right	Inguinal	1. 26. '06	Both testes placed in bottom of scrotum	Cord not transplanted	Suppuration	Traced 2 years. Testis in bottom of scrotum.
64	F. W. ....	6	Left	Inguinal	1. 20. '06	Both testes placed in bottom of scrotum	Cord not transplanted	Primary union	Died of scarlet fever while in hospital.
65	E. S. ....	9	Right	Inguinal	2. 2. '06	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Traced 1½ years.
66	W. W. ....	11	Left	Inguinal	2. 2. '06	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Traced 6 months.
67	S. S. ....	7	Left	Inguinal	2. 16. '06	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Not traced.
68	A. L. ....	6	Right	Inguinal	3. 16. '06	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Traced 2 years. Testis outside external ring, April 2, 1908.
69	G. M. ....	11	Right	Inguino-superficial	3. 30. '06	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Traced 2 years. Testis just outside external ring.
70	W. W. ....	4	Right	Inguino-superficial	4. 27. '06	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Traced 1 year. Testis not felt.
71	R. L. ....	11	Right	Inguino-superficial	3. 15. '07	Testes evenly placed in bottom of scrotum	Cord not transplanted	Primary union	Traced 1 year. Testis at external ring.
72	A. B. ....	13	Right	Inguino-superficial	3. 15. '07	Testis brought into mid-scrutum	Cord not transplanted	Primary union	Traced 1 year.
73	E. H. ....	12	Right	Inguino-superficial	3. 22. '07	Testis brought to bottom of scrotum	Cord not transplanted	Primary union	Not traced.
74	H. G. ....	5	Right	Inguinal	4. 19. '07	Testis brought into scrotum	Cord not transplanted	Primary union	Traced 1 year.
75	P. Z. ....	10	Right	Inguino-superficial	2. 15. '07	Testis brought into upper scrotum	Cord not transplanted	Primary union	Traced 1 year.
76	F. P. ....	12	Left	Inguino-superficial, also femoral hernia	5. 3. '07	Testis brought into bottom of scrotum	Cord not transplanted	Primary union	Traced 9 months.
77	V. B. ....	7	Right	Inguino-superficial	5. 24. '07	Sac rested on external oblique up to an external ring; testis in normal size, placed in scrotum	Cord not transplanted	Primary union	Not traced.
78	F. E. ....	4	Right	Inguinal	5. 24. '07	Testis brought into bottom of scrotum	Cord not transplanted	Primary union	Traced 9 months. Testis in upper scrotum.

TABLE OF CASES OF UNDESCENDED AND MALDESCENDED TESTIS ASSOCIATED WITH INGUINAL HERNIA. TREATED BY OPERATION. 1893 TO 1908.—SECTION OF CHILDREN.—Continued.

No.	Name	Age	Side	Position of testis	Date	Disposition of testis	Method of operation for hernia	Immediate result	Subsequent history
79	G. M. ....	5	Left	Inguinal	6, 10, '07	Testis brought into bottom of scrotum	Cord not transplanted	Primary union	Well 10 months.
80	A. B. ....	7	Right	Inguinal	6, 10, '07	Testis brought into bottom of scrotum	Cord not transplanted	Primary union	Traced only 2 months.
81	M. M. ....	6	Left	Inguinal	1, 3, '08	Testis brought into bottom of scrotum	Cord not transplanted	Primary union	Well at present; 3 months.
82	J. B. ....	7 m.	Left	Inguino-perineal, irreducible	1, 10, '08	Testis transplanted from perineum into bottom of scrotum. (Cong. Hernia)	Cord not transplanted	Primary union	Well at present; 4 months.
83	G. N. ....	6	Right	Inguinal	1, 24, '08	Testis placed in upper scrotum	Cord not transplanted	Primary union	Well at present.
84	L. R. ....	5	Left	Inguino-superficial	2, 21, '08	Testis placed in scrotum	Cord not transplanted	Primary union	Well at present.

TABLE OF CASES OF UNDESCENDED OR MALDESCENDED TESTIS ASSOCIATED WITH INGUINAL HERNIA. TREATED BY OPERATION. 1893 TO 1908.—(B) ADULTS.

No.	Name	Age	Side	Position of testis	Date	Disposition of testis	Method of operation for hernia	Immediate result	Subsequent history
85	M. G. ....	25	Right	Canal	1900	Testis brought into scrotum	C. N. T.	Primary union	Well 1 year.
86	J. R. ....	19	Right	Canal	1900	Testis brought into scrotum	C. N. T.	Primary union	Well 1 year.
87	Long .....	25	Right	Canal	1900	Testis brought into scrotum	C. N. T.	Primary union	Not traced.
88	W. G. ....	17	Right	Inguino-perineal	1901	Testis transplanted into scrotum	C. N. T.	Primary union	Well 6 years. Testis in lower abdomen, no atrophy.
89	J. T. ....	20	Left	Canal	1898	Testis brought into scrotum	C. N. T.	Primary union	Well 4 years. Testis external ring.
90	L. J. ....	17	Left	Canal	1898	Testis brought into scrotum	C. N. T.	Primary union	Well 6 years.

91	L. N. ....	30	Left	Inguino-superficial external	1898	Testis brought into scrotum	C. N. T.	Primary union	Not traced.
92	J. M. ....	27	Right	Inguino-perineal	1895	Testis atrophied. Remained	C. N. T.	Primary union	Well 1 year.
93	R. ....	17	Left	Very long	3, 15, '06	Testis brought into upper scrotum	C. N. T.	Primary union	
94	C. D. ....	30	Right	Canal (epilepsy)	1903	Testis brought into scrotum	C. N. T.	Primary union	Well 5 years. Testis in scrotum; no further attack of epilepsy.
95	H. W. ....	30	Right	Inguino-superficial	1902	Testis brought into scrotum	C. N. T.	Primary union	1 year later testis outside external ring. Not traced.
96	W. K. ....	23	Left	Abdominal retention	1903	Testis brought to upper scrotum	C. N. T.	Primary union	Well 1 year.
97	C. S. ....	28	Right	.....	1902	Testis brought into scrotum	C. N. T.	Primary union	
98	G. D. ....	17	D'ble	Canal, both sides	1902	Testis brought into scrotum	C. N. T.	Primary union	1 year later both testes in scrotum.
99	T. E. ....	40	Right	Inguino-perineal	1902	Testis transplanted into scrotum	C. N. T.	Primary union	Testis in scrotum 5 years later.
100	T. S. ....	20	Left	Inguino-superficial	1902	Testis brought into scrotum	C. N. T.	Primary union	
101	S. S. ....	18	Right	Inguino-superficial	.....	Testis brought into scrotum	C. N. T.	Primary union	
102	T. S. ....	33	.....	Inguino-superficial	1903	Testis brought into scrotum	C. N. T.	Primary union	
103	J. I. ....	29	Right	Inguino-perineal	1907	Testis transplanted into scrotum	C. N. T.	Primary union	Testis soon got back into perineum; second operation October, 1907, situated in scrotum. Perfect result April, 1908.
104	C. D. ....	16	Right	Inguino-perineal	1896	Testis transplanted into scrotum	C. N. T.	Primary union	Not traced.
105	W. C. ....	35	Right	Inguino-perineal	1896	Testis transplanted into scrotum	C. N. T.	Primary union	Hernia recurred 1 year later.
106	A. S. ....	20	Left	Inguino-superficial	1905	Testis brought into scrotum	C. N. T.	Primary union	Not traced.
107	H. L. ....	45	Left	Abdominal	5, 23, '06	Testis atrophied; removed. Could be brought only into canal.	C. N. T.	Primary union	
108	T. G. ....	25	Right	Inguino-superficial	1, 22, '06	Testis atrophied; removed. Could be brought only into canal.	C. N. T.	Primary union	Well 2 years later.
109	E. M. ....	38	Right	Canal	July, '06	Testis brought into scrotum	C. N. T.	Primary union	Not traced.
110	D. R. ....	22	Right	Inguino-superficial	11, 14, '06	Testis brought into scrotum	C. N. T.	Primary union	Not traced.

TABLE OF CASES OF UNDESCENDED AND MALDESCENDED TESTIS ASSOCIATED WITH INGUINAL HERNIA. TREATED BY OPERATION. 1893 TO 1908.—ADULTS.—Continued.

No.	Name	Age	Side	Position of testis	Date	Disposition of testis	Method of operation for hernia	Immediate result	Subsequent history
112	S. G. ....	22	Left	External ring	4, 10, '07	Testis brought into scrotum	C. N. T.	Primary union	Not traced.
113	M. E. ....	16	Left	Inguino-superficial	Apr., '07	Testis transplanted into scrotum	C. N. T.	Primary union	Not traced.
114	O. R. ....	30	Right	Bilocular sac	Feb., '06	Testis transplanted into scrotum	C. N. T.	Primary union	Not traced.
115	H. W. ....	20	Right	Inguinal	Feb., '06	Testis transplanted into scrotum	C. N. T.	Primary union	Not traced.
116	G. T. ....	14	Left	Inguinal	Aug., '04	Testis transplanted into scrotum	C. N. T.	Primary union	Well 3½ years. Testis increasing in size. Hernia cured.
117	B. A. ....	23	D'ble	Left inguinal, Right abdominal	10, 20, '04	Left operation (Dr. Parsons). Right testis in abdomen not traced	C. N. T.	Primary union	Not traced.
118-119	E. R. ....	16	D'ble	Inguinal	Nov., '04	Testis brought into scrotum. (Op. Dr. Downs)	C. N. T.	Primary union	Right testis in scrotum two years later; left external ring.
120	S. M. ....	31	Left	Inguinal	Feb., '05	Testis brought into scrotum	C. N. T.	Primary union	Testis in middle scrotum March 27, 1908. nearly 3 years.
121	A. B. ....	41	Right	Superficialinguinal	5, 4, '05	Testis brought into scrotum	C. N. T.	Primary union	March 28, 1908, letter states slight relapse; no hernia.
122	L. F. ....	35	Left	Superficialinguinal	Oct., '05	Testis brought into scrotum	C. N. T.	Primary union	Testis in bottom of scrotum; no atrophy 3½ years later.
123	F. C. ....	22	Right	Superficialinguinal	11, 22, '05	Testis brought into scrotum	C. N. T.	Primary union	No atrophy of testis.
124	J. C. ....	16	Right	Canal	12, 6, '05	Testis brought into scrotum	C. N. T.	Primary union	Well at present. Testis upper scrotum.
125	S. ....	20	Right	Inguino-superficial	7, 19, '07	Testis brought into scrotum	C. N. T.	Primary union	Testis in scrotum.
126	A. H. ....	24	Right	Inguino-superficial and interstitial bilocular sac	3, 19, '08	Testis brought into scrotum	C. N. T.	Primary union	Testis in scrotum.
127	H. W. ....	17	D'ble	Abdominal	4, 16, '08	Right testis brought into upper scrotum. No operation on left side	C. N. T.	Primary union	Testis in scrotum.
128	J. B. ....	22	Right	Abdominal	4, 16, '08	Right testis brought into upper scrotum	C. N. T.	Primary union	Testis in scrotum.

## CONCLUSIONS.

From my own observations as well as from a careful study of the reports of other surgeons, I believe the following conclusions are justified:

1. The undescended testis is almost invariably of little or no functional value. It often gives rise to considerable pain and is more subject to inflammatory attacks than the normally descended organ and, possibly (though this is by no means proven), is more subject to malignant changes.

2. The undescended testis should never be sacrificed in children and very rarely in adults, it having been proven possible to effect a radical cure of the hernia quite as well without the removal of the organ. In childhood the testis, even if it never attains any functional value, is nevertheless of value in developing the male characteristics of the child as well as in promoting his general health. In the adult, it should be retained for its influence upon the mentality of the subject, if for no other reason.

3. Operation should seldom be performed under the age of 8 to 12 years, unless the accompanying hernia demands such operative intervention, for the reason that in a considerable number of cases the testis descends spontaneously on the approach of puberty, unless double.

Abdominal ectopia unless double had best be left untreated, inasmuch as operation is difficult and by no means free from risk.

4. As to methods of operation, the main principles of any operation likely to yield satisfactory results, must be: Free opening of the inguinal canal, which is secured by Bassini's incision; thorough freeing of the testis from any adhesions or peritoneal bands, even with the sacrifice of some of the veins, if necessary; bringing the testicle into the scrotum; suture of the canal without transplantation of the cord.

The present tendency in favor of giving up all forms of suturing the testis, either to the scrotum, the other testis or the thigh is, I believe, fully justified.

Inasmuch as very satisfactory results may be obtained without cutting away all the structures of the cord except the

vas and its vessels, I believe this more radical step very seldom indicated.

5. No case of double undescended testis should be allowed to reach the age of puberty.

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